2011-2012
IB MYP YEAR 4

SUMMATIVE ASSESSMENT

Year 9 Mathematics (Extended)

Name: Elizabeth Kot [9 Jay]

Date of task: **8th June, 2012** Time allowed: **1.5 hours (11:40 -13:10)**

Teacher: **Ms Li** / **Mr Millard** / **Mr So**

Student's **Performance** in Different **Criteria**			
A	4	**C**	4

Instructions

- Read the instructions for all questions carefully.
- All work must be hand written.
- All work, steps and proper units must be shown.
- A non-electronic dictionary is allowed.
- Use of calculator is allowed.

Advice:

- Read the criteria descriptors and task-specific rubrics carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest levels in this task.

- This assessment task will be assessed on Criterion **A** & **C**.
  - For Criteria **A**, the questions are all assigned with levels;
  - Criterion **C** will be assessed as an overall impression on the presentation of work in this assessment.

ASSESSMENT CRITERIA

Criterion A: KNOWLEDGE AND UNDERSTANDING

Achievement level	Task Specific Rubric	IBO Published Descriptor
0	The student does not reach a standard described by any of the descriptors given below.	The student does not reach a standard described by any of the descriptors given below.
1–2 **Simple**	The student can solve **some simple** problems.	The student **generally** makes appropriate deductions when solving **simple** problems in **familiar** contexts.
3–4 **Complex**	The student can solve **most simple** and **some more complex** problems.	The student **generally** makes appropriate deductions when solving **more complex** problems in **familiar** contexts.
5–6 **Challenging**	The student can solve **some challenging** problem along with **all** different types of problems.	The student **generally** makes **appropriate** deductions when solving **challenging** problems in a **variety** of **familiar** contexts.
7–8 **Unfamiliar**	The student can solve **most** challenging and **most unfamiliar** problems along with **all** different types of problems.	The student **consistently** makes **appropriate** deductions when solving **challenging** problems in a **variety** of contexts including **unfamiliar** situations.

Criterion C: COMMUNICATION IN MATHEMATICS

Achievement level	Task Specific Rubric	IBO Published Descriptor
0	The student does not reach a standard described by any of the descriptors given below.	The student does not reach a standard described by any of the descriptors given below.
1–2	The student should be able to explain **some problems** step by step. The lines of reasoning are **difficult to follow**.	The student shows **basic** use of mathematical language **and/or** forms of mathematical representation. The lines of reasoning are **difficult to follow**.
3–4	The student should be able to explain **most problems** step by step. The lines of reasoning are **clear** though **not always logical** or **complete**.	The student shows **sufficient** use of mathematical language **and** forms of mathematical representation. The lines of reasoning are **clear** though not always **logical** or **complete**. The student moves between different forms of representation **with some success**.
5–6	The student should be able to explain **most problems** step by step. The lines of reasoning are **concise**, **logical** and **complete**. The student use **correct unit** in the questions.	The student shows **good** use of mathematical language **and** forms of mathematical representation. The lines of reasoning are **concise**, **logical** and **complete**. The student moves **effectively** between different forms of representation.

A. SIMPLE PROBLEMS

Suggested time allocation for Question **1 to 5** is **15 minutes**.

1. Given the points A (–1 , 2) and *B* = (2 , ***k***), find the value(s) of ***k*** such that the **length of line AB is 5 units**.

$AB = 5$

$5 = \sqrt{(2-k)^2 + ((-1)-2)^2}$

$5 = \sqrt{4+k^2+9}$

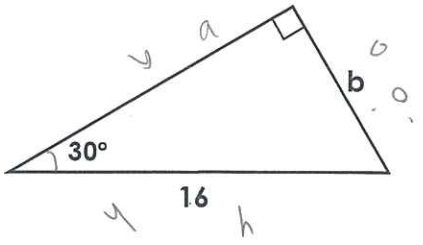
$5 = \sqrt{13+k^2}$

$5 - k = 3.6$

$-k = 3.6 - 5$

$k = 1.4$ ✓

2. In the figure on the right, find the value of **b** **without using calculator**.



$\sin 30° = \frac{b}{16}$

$\frac{1}{2} = \frac{b}{16}$

$2b = 16$

$b = \frac{16}{2}$

$b = 8$ ✓

$\sin 30° = \frac{1}{2}$

$y = 4 + 2x$

3. Given that the equation of the line **L1** is $y - 2x = 4$, which of the following line(s) is/are **parallel to L1**? Which of the following line(s) has/have **negative y-intercepts**?

L2: $y = -2x + 4$ **L3:** $2y - 4x - 5 = 0$ **L4:** $-3y = 2x + 4$ **L5:** $6x - 9 = 3y$

$2y = 5 + 4x$

$-3y = 2x + 4$

$2x - 3 = y$

$3y = 6x - 9$

$y = 2x - 3$

Explain your answers by showing your calculations.

L1 is parallel to L5 and L4

L1 = $y = 2x + 4$

L5 = $y = 2x - 3$ same slope

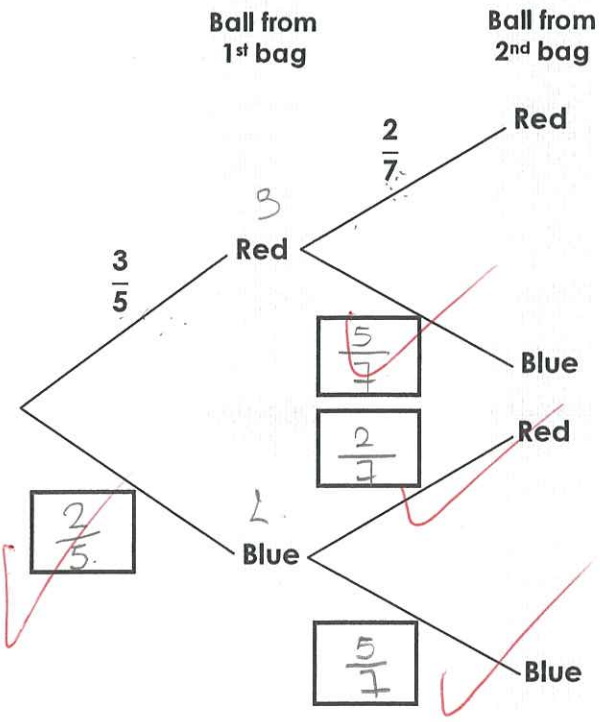
L4 = $-3y = 2x + 4$

Negative y-intercept

L5 = $y = 2x - 3$ ✓

4. Loren has two bags. The **first** bag contains **3 red** balls and **2 blue** balls. The **second** bag contains **2 red** balls and **5 blue** balls. Loren takes **1 ball** at random from **each bag**.

(a) Complete the probability **tree diagram** by entering the **correct answers into the boxes.**



(b) Find the probability that Loren takes **two red balls.**

$P(2 \text{ red balls}) = \frac{5}{12} \times 2$

$= \frac{10}{12}$

$= \frac{5}{6}$

5. Evaluate the following **without using calculator.**

$$\sin^2 23° + \cos^2 23° - \frac{\sin 45°}{\cos 45°}$$

$\sin^2 23° + \cos^2 23° - \frac{\sin 45°}{\cos 45°}$

$= 1 - \tan 45°$

$= 1 - \frac{\sqrt{3}}{1}$

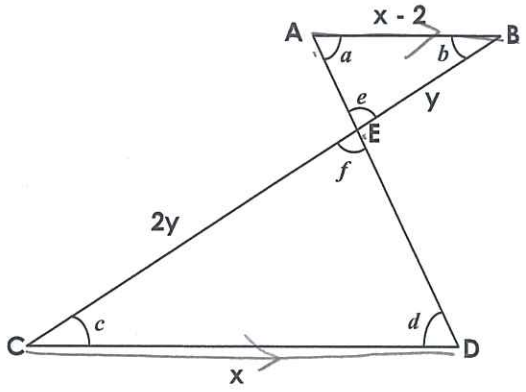
$=$

$\frac{\sqrt{3}}{3} \quad \frac{1}{\sqrt{3}} \quad 1 \,|\, \sqrt{3}$

B. MORE COMPLEX PROBLEMS

Suggested time allocation for Question **6 to 9** is **25 minutes**.

6. In the figure below, the line AB is parallel to the line CD and some dimensions are shown in terms of x or y.



(a) Show that Δ **ABE** and Δ**DCE** are **similar**. State the reason(s) if necessary.

∵ ∠AEB = ∠DEC (vert. opp. ∠s)
∵ ∠ABE = ∠DCE (alt. ∠s AB // CD)
∵ ∠BAE = ∠CDE (alt. ∠s AB // CD)
∴ ΔABE ~ ΔDCE (equiangular).

(b) Find the value of **x**.

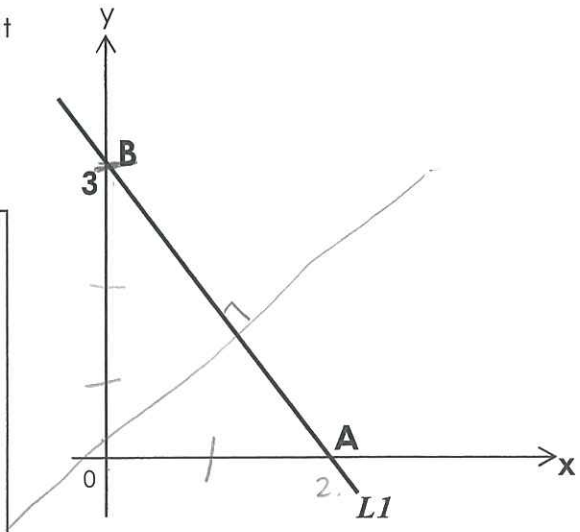
∵ ΔABE ~ ΔDCE (proofed)
∴ AB = CD
$x - 2 = x$

$2x = 2$

$x = \frac{2}{2}$

$x = 1$ //

7. In the graph on the right, a line ***L1*** cuts the x-axis and y-axis at point **A** and **B** respectively. The y-intercept is 3.



(a) If the area of the triangle AOB is 3 square units, find the **equation** of ***L1***. Express your answer in **slope-intercept form**.

$y = mx + c$ $\quad 3 \div 3 = 1$

$y = \quad + c$

(b) If a line ***L2*** is **perpendicular** to ***L1*** and two lines intersect at point **D(4,-3)**, find the equation of ***L2***. Express your answer in **general form**.

8. In a certain dice game, the player throws **two** typical unbiased **six-faces dice** and receives **$5** if the sum is **7 or 11**, otherwise he or she **pays $2**.

(a) Calculate the probability of obtaining the **sum of 7 or 11** when you **throw the two dice once**.

$P(\text{sum of } 7, 11) = \frac{6+2}{36}$

$= \frac{8}{36}$

$= \frac{2}{9}$ //.

(1,6) (2,5) (3,4)
(4,3) (3,2) (6,1)
(3,6) (6,5)

(b) If you play the game **18 times**, calculate the **amount of money** you **expect to gain or lose**.

Gain

$\left(\frac{2}{9} \times 5\right) \times 18$

$= \frac{10}{9} \times 18$

$= \frac{180}{9}$

$= 20$ //.

Lose

$\left(\frac{7}{9} \times 2\right) \times 18$

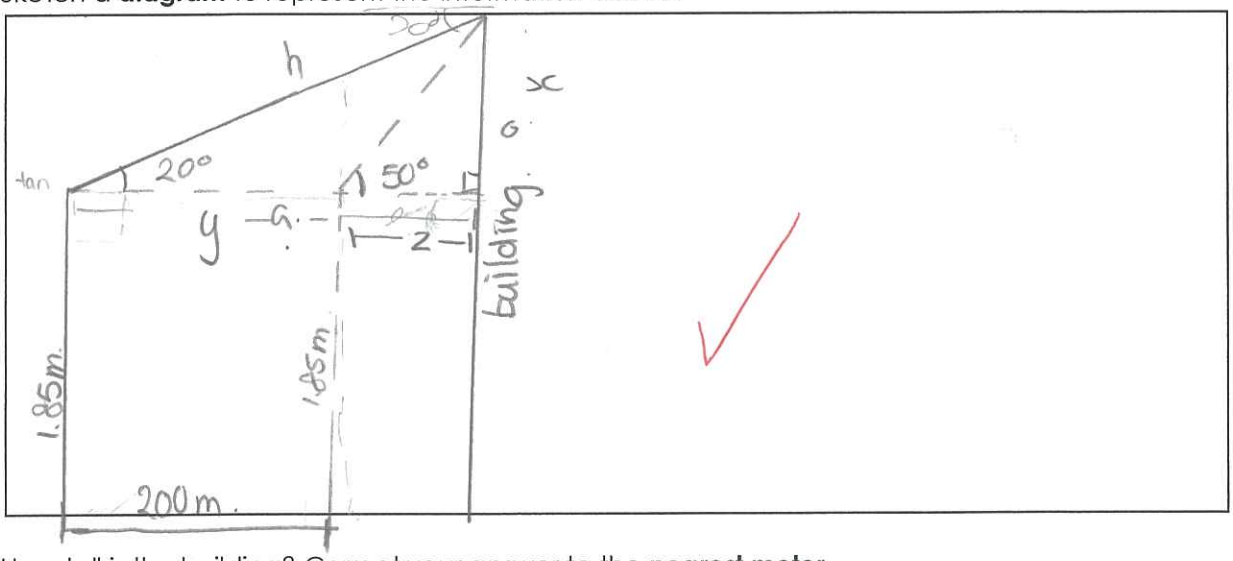
$= \frac{14}{9} \times 18$

$= \frac{252}{9}$

$= 28$ //.

9. Mr Bolivar, a volunteer fireman who is 1.85 m tall, is running towards a burning building where there is a fire on the roof. Initially, his angle of elevation to the roof is 20°. He runs for 200 m and now his angle of elevation is 50°. Assume that the ground is horizontal and the building is vertical.

(a) Sketch a **diagram** to represent the information above.



(b) How tall is the building? Correct your answer to the **nearest meter**.

$$\tan 50^\circ = \frac{x}{y-200}$$

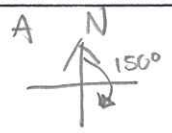
$$x = \frac{\tan 50^\circ}{y-200}$$

C. CHALLENGING PROBLEM

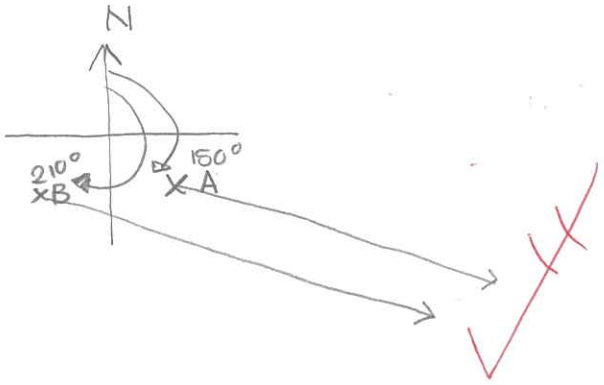
Suggested time allocation for Question **10 and 11** is **30 minutes**.

10. Ship **A** leaves the harbor H on a bearing **150°** with a speed of **40** km/hr. At the same time, Ship **B** leaves harbor H on a bearing **210°** with a speed of **40** km/hr.

(a) **After 12 minutes**, how far did ship A and ship B travel?



(b) Sketch a **diagram** to represent the information above **12 minutes after the two ships left the harbor.**



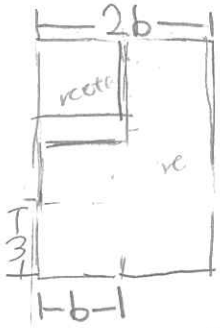
(c) Find the **true bearing from Ship A to Ship B** 12 minutes after they left the harbor.

(d) Find the **distance between the two ships** 12 minutes after they left the harbor. Give your answer to the **nearest meter.**

11. The properties of a rectangle and a square are given below:

- The length of the rectangle is 3 cm longer than the side of the square.
- The width of the rectangle is double the length of the side of the square.

If the **sum of their areas** is **24 cm²**, find the **dimensions** (that is, its length and width) of the rectangle.



rectangle $= (b+3) \times 2b$

Square $= 2b \times b$

$((b+3) \times b^2) + (b \times b) = 24$

$(b+3) \times b^2 = 24 - b^2$

$b+3 \times b^2 = 24 - b^2$

$3 + b^3 = 24 - b^2$

$b^3 + b^2 = 24 - 3$

$b^5 = 21$

$b = 1.67$ (3. sig. fig)

length $= b + 3$

$= 1.67 + 3$

$= 4.67$.

Width $= 2b$

$= 1.67 \times 2$

$= 3.34$

D. Unfamiliar problems (Suggested time allocation for Question **12 and 13** is **30 minutes**.)

12. At noon, Tom and Pete both park at the same starting point. Tom starts to ride his bike at 8 miles/hr. Two hours later, Pete starts after Tom on a bicycle at 12 miles/hr.

(a) How far will Tom have ridden before he is **overtaken by Pete**?

Tom = 12 x 2
= 24.

Pete = 8 x 2
= 16.

Tom will travel 24 m before overtaken by Pete.

(b) At what time will Tom and Pete be **8 miles** apart?

12 x 2.2
= 26.4

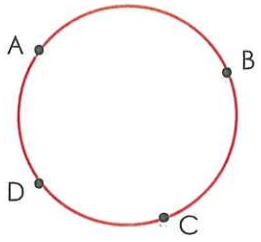
8 x 2.2
= 17.6

26.4 - 17.6
= 8.8 miles.

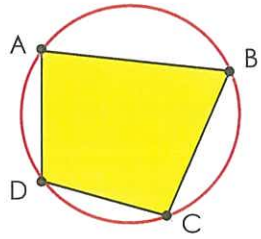
Tom and Pete will be 8 miles apart when it is 2 hours and 12 minutes.

13. Please read the following information and then do the proof on next page.

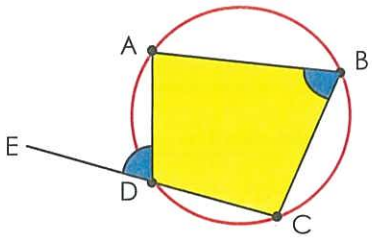
Points lie on the **same circle**, as the diagram below, are said to be **concyclic**. For example, A, B, C and D are **concyclic points**.



If the vertices of a **quadrilateral** lie on a **circle**, as the diagram below, then the quadrilateral is said to be **cyclic**. For example, ABCD is a **cyclic quadrilateral** since the vertices A, B, C and D lie on the circle.

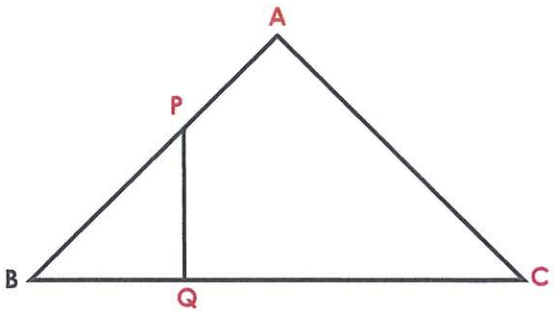


If the side CD is produced (i.e. extended) to E, as the diagram below, then ∠**ADE** is called the **exterior angle of the cyclic quadrilateral** ABCD, and ∠**ABC** is said to be the **interior opposite angle**.



Theorem: **If ∠ADE = ∠ABC, then A, B, C and D are concyclic. (ext.∠, int. opp.∠)**

In the figure below, **ΔABC** and **ΔBPQ** are **isosceles** triangles such that **AB = AC** and **BQ = PQ**.
Using the provided information about the concyclic points and cyclic quadrilateral, **prove** that **A, P, Q and C are concyclic**.



End of Assessment